Table 1: Suggested trash TMDL endpoint(s), including their potential applicability and associated compliance determination.

SUGGESTED ENDPOINT[1]			COMPLIANCE APPROACH							
OPTIONS[2]	OPTION INTERPRETATION[3]		STRATEGY		IMPLEMENTATION[4]		MONITORING[5]		COMPLIANCE DETERMINATION	
	Option/Element/ Variant	Detailed Description	Point Sources[6]	Non-Point Sources[7]	Point Sources	Non-Point Sources	Point Sources	Non-Point Sources	Point Sources	Non-Point Sources
Zero Trash[8,9]	"Zero" defined as no trash at all.	"Zero" means "zero." [No dependency on a qualifying cleaning-up event.]	• Prohibit discharge of trash to surface waters. • Structural or non-structural Best Management Practices (BMPs). • Install full capture systems in all storm drains, or a demonstrable and equally performing alternative system.	• Structural or non-structural Best Management Practices (BMPs). • No trash immediately after each clean-up event. • No trash accumulation in deleterious amounts between clean-up events. • No illegal dumping.	• Install and maintain full capture systems in MS4/storm drain areas that capture runoff from priority: ○ Develop estimates of trash load reduction target(s) if full capture systems are implemented for all storm drains in the relevant areas. ○ Identify appropriate structural and non-structural Best Management Practices (BMPs) to use (e.g. skimmer boats, etc.). ○ Demonstrate that the selected BMPs have the ability to remove trash, or otherwise assume 100% removal. ○ Cleanup regularly. ○ Allow for a permittee (e.g. MS-4, DC Water, etc.) derived approach and consider including issuance of special conditions or conditional waivers to manage special conditions (e.g. CSS/CSOs as articulated in DC Water's letter[10] to EPA). ○ Implement identified BMPs to the extent that is not too cost-prohibitive (DC water's letter has serious concerns with costs). ○ Conduct annual BMPs cleaning and maintenance program. • If full capture is not possible or viable, demonstrate equivalency in performance. • Build consensus around a realistic number of years or permit cycles – even if only aspirational – within which to achieve "zero" trash. • Conduct public education and outreach (e.g. change in behavior, or against illegal dumping, etc.). • Develop a monitoring and reporting system/program.	• Install and maintain full capture systems in storm drain areas that capture runoff from priority land-uses: ○ Identify the storm drains and associated impacted priority land uses. • Cleanup regularly. • Require monitoring report(s) – annual is preferable. • Enforce relevant pieces of legislation: ○ The Bag Law (DC). ○ Anti-dumping. • Build consensus around a realistic number of years/ permit cycles –even if only aspirational – within which to achieve "zero" trash, or develop an equivalent approach. • Conduct public education and outreach (e.g. change in behavior, or against illegal dumping, etc.).	• NPDES permit-based monitoring requirements: ○ Monitoring and reporting cycle/frequency; ○ Trash collection frequency; ○ Maintain a running tally of removed trash to allow ready comparison with established baseline load. ○ Catch-basin cleanup frequency; ○ Regular street sweeping, ○ Special conditions, including notification and reporting. • Establish record keeping procedures for in-stream trash removed by skimmer boats: ○ Ensure that the right measurement type is selected and weights (wet/dry) are recorded correctly (see **Table 2**). • Monitor outfall discharges regularly (MS4, CSO bypasses, etc.).	• Develop a monitoring and assessment program: ○ Assessment (see suggested methods in **Table 2**). ○ Trash collection frequency (minimum). ○ Inspections and reporting plan. • Monitoring program should track the accumulation of trash in deleterious amounts that would cause nuisance and/or adversely affect beneficial use(s) between cleanup events, including: ○ Establishing a procedure for selecting representative site(s). ○ Capturing trash load reduction /capture rates at representative locations and application to all similar land uses, if needed. ○ Analyzing trash reduction trends. ○ Developing data and information to help establish trash collection intervals that prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections.	• Monitoring and reporting plan submittal: ○ Include a provision for stakeholders' input/assessment and regular updates based on lessons learned. • No trash after each cleanup event. • No accumulated trash – this could be conducted continuously or periodically: ○ Trash level should be less than average baseline waste load allocation (WLA). ○ Trash quantity in a decreasing trend, including the amounts removed by skimmer boats. ○ Demonstration from stakeholder surveys, report cards, etc. ○ However, if trash is accumulating: ▪ Impose additional BMPs ▪ Increase frequency of trash removal, including skimmer boat schedule. • Citizen's/stakeholder's comments on annual report(s)[11], including reports that may be shared on as-needed-basis. • NPDES permit compliance reporting; may comprise annual reports, or other requirements: ○ Including status report on the prohibition of discharge of trash to surface waters. • Others (??).	• Monitoring and reporting plan submittal: ○ Include a provision for stakeholders'input/assessment and regular updates based on lessons learned. • No trash after each cleanup event. • No trash accumulating in deleterious amounts: ○ Trash level should less than baseline load allocation (LA); or ○ Trash quantity in a decreasing trend; or ○ Demonstrations from surveys, report cards by stakeholders. ○ However, if trash is accumulating: ▪ Increase cleanup frequency [12](e.g., street sweeping, etc.) ▪ Impose additional BMPs[13] ▪ Incentivize increased volunteer cleanups, etc. • Regular and timely annual reporting. • Citizen's/stakeholder's comments on annual reports, including reports that may be shared on as-needed-basis. • Other (??).
		"Zero" is operationally defined as having no trash immediately after each clean-up event.								
	Qualified "zero" (Defined Numeric Target). "Zero" defined as **<u>trash quantity/</u>** threshold *with* qualifying trash clean-up event.	"Zero" is operationally defined as having no trash accumulating in deleterious amounts between clean-up events.								
Rating Score[14,15]	*Optimal*: **16-20**	Interprets WQS[16] as allowing some (*rated*) level of trash in the river, which meets the definition of a								
	Sub-Optimal: **11-15**									
	Marginal: **06-14**									

[1] It is assumed that a particle less 5 mm in size is not considered as trash. It is further assumed that trash is a candidate pollutant for TMDL development.
[2] These options and notes are based, in part, on Ms. Jillian Adair's conference call notes of December 3, 2018 and other publicly available sources.
[3] Please consider whether or not these interpretations are accurate, reasonable and/or appropriate.
[4] Please see DOEE's [HYPERLINK "https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/Draft_Strategy_For_Public_Input.pdf"] and MDE's [HYPERLINK "https://mde.maryland.gov/programs/Water/TMDL/DataCenter/Documents/Trash%20Implementation%20Plan%20Guidance_052014.pdf"] and [HYPERLINK "https://mde.maryland.gov/programs/Water/TMDL/DataCenter/Documents/Monitoring_070214.pdf"]. These documents are equally useful with respect to monitoring.
[5] See **Table 2** for details on the advantages and disadvantages of various trash monitoring/assessment methods.
[6] Comprises of the MS4, identified outfalls, etc. and involves trash conveyed by storm water through storm drains or pipe network.
[7] Includes open spaces, parks, transportation corridors and private properties next to waterbodies. See also
[8] Although "zero trash" as defined herein was challenged in the LA Trash TMDL case, no other viable number or alternative endpoint was provided – and none has been provided since - that would <u>*support beneficial uses*</u>. "Zero" trash as an endpoint enables the quantification of TMDL loads and individual components. In the vacated Anacostia Trash TMDL, the "zero" endpoint was used as an in-stream endpoint to calculate waste load allocation (WLA).
[9] It is critically important to note that the Anacostia River trash TMDL - which currently stands vacated, but whose vacatur was stayed pending development of a replacement ([HYPERLINK "https://cases.justia.com/federal/district-courts/district-of-columbia/dcdce/1:2016cv01861/181645/28/0.pdf?ts=1522488413"]) - was based on an "<u>*other appropriate measure*</u>" [40 CFR § 130.2(i)] rather than an actual or the more conventional "<u>*mass-per-unit time measure*</u>" framework. The "<u>*other appropriate measure*</u>" framework was selected, in part, because trash is a unique pollutant whose impacts are aesthetic in nature - and thus difficult to objectively enumerate easily or quantify readily. At this time, it is clear that the court did not buy into the "<u>*other appropriate measure*</u>" framework – and left no doubt about its preference for "<u>*mass-per-unit time measure*</u>"/construct. Thus, to be accepted as adequate and satisfactory, at least in the eyes of the court, this trash TMDL revision - if based on "zero" endpoint - must be aligned to fit the "<u>*mass-per-unit time measure*</u>" framing. It is important to remember that the "<u>*mass-per-unit time measure*</u>" or construct aligns very well with <u>*a maximum load that is allowed into a waterbody*</u> while still meeting water quality standard (WQS). However, "<u>*mass-per-unit time measure*</u>" does not readily align that well with <u>*a maximum load that is prevented from entering a waterbody*</u>. <u>*A load that is prevented from entering a waterbody*</u> is much harder to tie back to WQS or beneficial uses. Thus, this TMDL revision must address how a "zero" endpoint within a "<u>*mass-per-unit time measure*</u>"/framework take us to <u>*a maximum load that a waterbody*</u> can take and still meet water quality standard (WQS). This is even more so with respect to this revision considering that EPA did not appeal the [HYPERLINK "https://cases.justia.com/federal/district-courts/district-of-columbia/dcdce/1:2016cv01861/181645/28/0.pdf?ts=1522488413"] ruling, and given the recent Supreme Court ruling regarding the [HYPERLINK "https://www.supremecourt.gov/opinions/18pdf/18-15_9p6b.pdf"] (i.e., federal judges deferring to agency expertise) – which is now more circumscribed than before. Attention should also be paid to prior TMDLs-related court rulings such as the "daily means daily."
[10] DC Water's letter of March 15, 2019 to EPA (Attn: Ms. Jillian Adair) regarding the development of a new or replacement trash TMDL in Anacostia River Watershed.
[11] In an article available [HYPERLINK "https://www.chesapeakebaymagazine.com/baybulletin/2019/6/6/anacostia-flunks-river-report-card-rain-to-blame"], a stakeholder (The Anacostia Watershed Society (AWS) acknowledges in its report card that "the DC Water tunnel … **captured over 200 tons of trash. "And the report card saw its first passing grade for Trash Reduction**, thanks to cleanup efforts and ban on some materials."
[12] In DC, frequency of trash collection/cleanup must be coordinated with the District of Columbia's Department of Public Works (DC-DPW).
[13] In urban settings (e.g. DC), there is a limit to the number of BMPs that can be installed, in part, because resources are limited, but more importantly because there are not many places where structural BMPS can be installed – some sort of BMPs saturation, if you will.
[14] This is a semi-quantitative scores within the Rapid Trash Assessment (Moore et al., 2007) in which a unit is a categorical score from 0 to 20 that corresponds to the visually assessed condition of the site: **Poor** (0-5): Trash abundant and unsightly; **Marginal** (6-10): trash present in moderate amounts; **Sub-Optimal** (11-15): trash present in minor amounts; **Optimal** (16-20): Little or no trash visible from stream channel or riparian zone.
[15] Moore, S., Cover, M.R., Senter, A., 2007. Report: A rapid trash assessment method applied to water of the San Francisco Bay Region: Trash measurements in streams, California Regional Water Quality Control Board, San Francisco Bay Region (available [HYPERLINK "https://www.waterboards.ca.gov/rwqcb2/docs/swampthrashreport.pdf"]).
[16] The water quality objective: "Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses."

	Poor: **00-05**	TMDL (realistic, but likely to be controversial).								
Suggestions by Stakeholders										

Table 2[17]. General advantages and disadvantages of qualitative, semi-quantitative, and quantitative trash assessment approaches (slightly modified from Wheeler and Knight (2017)[18]; see page 11).

Measurement Type	Advantages	Disadvantages
1. Qualitative[19]	• **Helps to identify sources of trash**	• **May be less accurate than other measurement types (or "the least accurate method")**
1.1 Trash Characterization	• Helps to identify sources of trash • May be required for assessment of product bans	• Time consuming to implement • Weathering of debris can make it difficult to identify trash type and may result in under- or mis-classification
1.2 On-Land Visual Assessment	• Requires less time to implement • Reduced sampling time enables more sites to be monitored for a given effort • Logistically easy to implement, particularly for sampling locations that are challenging to access • Measurement error is relatively low, with sufficient training	• Limited application and validation in receiving waters • Requires an initial paired quantitative assessment in order to develop a conversion factor from qualitative scores to quantitative values • Categorical score definitions need to be consistent in order for data to be comparable to other OLVA monitoring programs • Without established conversion factors, OLVA data alone prevent the calculation of a percent change in the amount of trash over a given time period
2. Semi-quantitative[20]	• **Cost-effective compromise if quantitative methods are infeasible**	• **Less accurate and lower data comparability than quantitative assessments**
2.1 Rapid Trash Assessment	• Provides a systematic approach for non-catchment systems (e.g., streams and shorelines) • Examines types of trash and identification of sources • Can generate consistent and comparable results • Most useful for identifying site-specific management actions to reduce trash loading in streams	• Risk of observer bias • Does not measure loading of trash downstream
3. Quantitative[21]	• **Precise** • **Higher data comparability** • **Amenable to statistical analyses**	• **Can be time consuming, difficult to implement, or may require technical training**
3.1 Counts	• Easy to train staff and other volunteers • Established protocols developed • A common assessment type, particularly for marine habitats • Method more informative relative to weight for light items (e.g., styrofoam and plastic bags)	• Time consuming • Many trash items break apart during the collection process (e.g., Styrofoam), introducing measurement error and/or bias into measurements • Small items are weighted equally to large items, unless the method categorizes counts by litter size
3.2 Weight (dry)	• It is easier to record data as weight and use results to demonstrate effectiveness. • Reduces bias due to trash water absorption	• Limited application • Trash items vary significantly in weight (heavy items are less mobile, lights materials are more mobile and, generally, pose a higher risk to species)
3.3 Weight (wet)	• Commonly used by media to communicate a story (e.g., X tons removed) • It is easier to record data as weight[22] and use results to demonstrate effectiveness.	• Higher potential to under value plastic or other light items because of the limited ability to detect changes in the amount or ratio of light trash types (e.g., plastic bags), which generally have a greater environmental impact • Higher measurement error in the conversion of weight to counts (vs. counts to weight)

[17] Selecting the measurement type to use in a monitoring program must take into account many factors and constrains in a jurisdiction.

[18] Wheeler, S. G., and Knight, E.K. 2017. Monitoring Considerations for the Trash Amendments. California Ocean Science Trust. Oakland, CA (available [HYPERLINK "https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/trash_implementation/monitconsidfortrashamend_july2017.pdf"]). Some of the details summarized in Wheeler and Knight (2017) are found in Cheshire et al (2009), which is available [HYPERLINK "https://www.nrc.govt.nz/media/10448/unepioclittermonitoringguidelines.pdf"].

[19] "A visual methodology that categorizes trash levels into 'bins' or scores is used to assess the trash condition or amount in an area. The assessment area should be pre-defined and documented." (Wheeler and Knight, 2017).

[20] "Scores within the Rapid Trash Assessment where a unit is a categorical score from 0 to 20, which corresponds to the visually assessed condition of the site." (Moore, S., Cover, M.R., Senter, A., 2007. Report: A rapid trash assessment method applied to water of the San Francisco Bay Regi measurements in streams. California Regional Water Quality Control Board, San Francisco Bay Region (available [HYPERLINK "https://www.waterboards.ca.gov/rwqcb2/docs/swampthrashreport.pdf"]).

[21] Methodologies used to enumerate the amount (by counts, weight or volume) and dynamics of trash in the environment.

[22] Track 1: Permittees install, operate, and maintain a network of certified Full Capture Systems (FCS) to capture trash in the storm drains, located in priority land use areas for municipal systems, and the entire facility for industrial and commercial permit holders. • Track 2: Permittees install, operate, and maintain any combination of controls (structural and/or institutional) anywhere in their jurisdiction as long as they can demonstrate that their system performs as well as Track 1 and are not cost-prohibitive (e.g., Full Capture System Equivalency (see Appendix [HYPERLINK "https://www.epa.gov/sites/production/files/2016-02/documents/ca-amendment-appendixd.pdf"] and Appendix [HYPERLINK "https://www.epa.gov/sites/production/files/2016-02/documents/ca-amendment-appendixe.pdf"] of the 2015 Trash Amendment; further amended in January 5, 2017)). A DC example of where a stakeholder has used permit-related data in a manner that speaks to the effectiveness of wet weight trash removal/reduction is available [HYPERLINK "https://www.chesapeakebaymagazine.com/baybulletin/2019/6/6/anacostia-flunks-river-report-card-rain-to-blame"]

		• Higher measurement error due to extra weight of un-discarded water contained in trash (i.e., bottles and other plastic containers) (vs. weight of trash only)
3.4 Volume	• Easy to interpret (e.g., tells you how much litter - by volume - was measured) • Less susceptible to bias by light materials relative to weight	• Difficult to measure for many trash items with irregular shapes • Compacting trash in collection process changes volume measurements and creates unnecessary variability in results